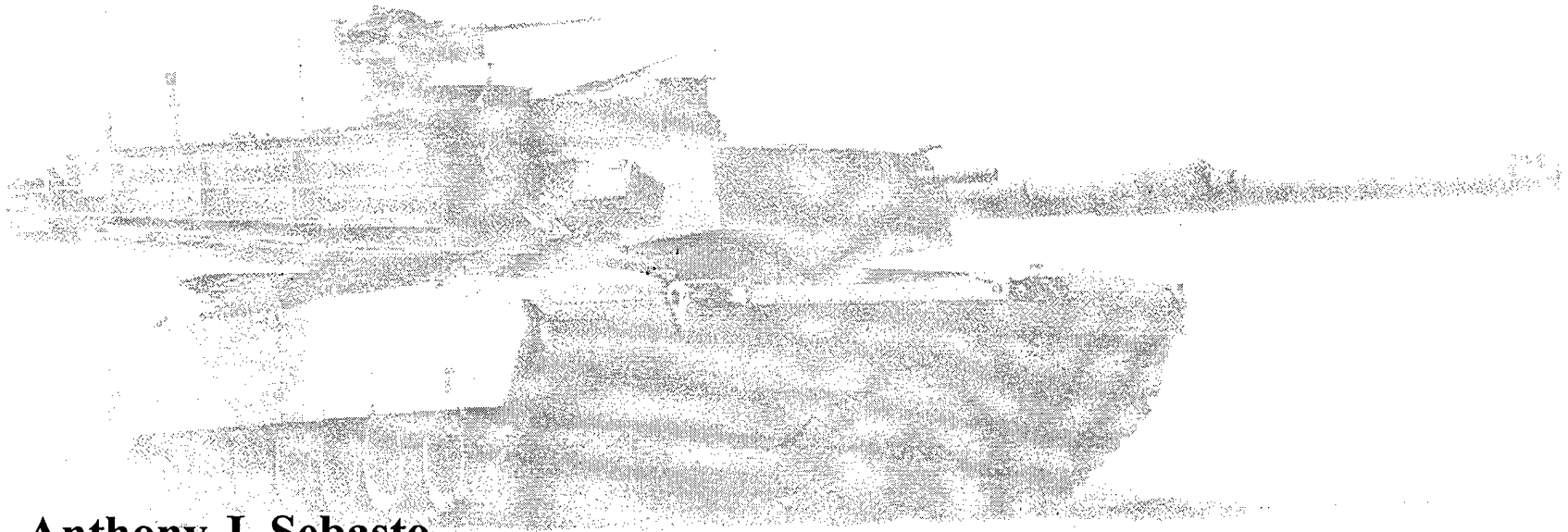
TACOM

Mobility and Firepower for America's Army

Tank Lethality Technology Development Update



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Outline

- Technology Thrusts
- KE Ammunition Technology Trends
- Current Initiatives
- Future Initiatives
- HTI Opportunities
- Summary

Major Technology Thrusts

- Defeat of Advanced Generations of Explosive Reactive Armors & New Complex Armors
- Extended Range Line-of Sight and Beyond Line-of-Sight Engagements
- Increased Accuracy at Extended Ranges Under ALL Vehicle Motion Conditions
- Advanced Propulsion Options Increasing Lethality While Reducing Vulnerability
- Wear and Erosion Resistant Barrel Coatings

Kinetic Energy Ammunition Technology Trends

1995	2000	2005	2010	2015	2020+

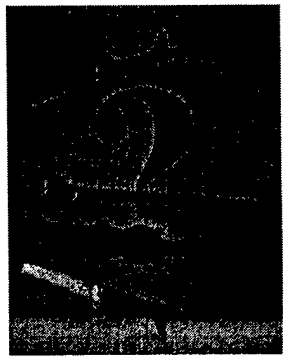
M829 Series

PM Funded:

- Lighter Sabots
- Advanced Propulsion
- New Penetrator Alloys

Adv KE Cartridge

- Novel Penetrator
- Axial Thruster



Tech Base Components

- Novel Penetrators
- Adv Propulsion (Conventional/Electrothermal-Chemical)
- Axial/Radial Thrusters (Enhanced Accuracy)

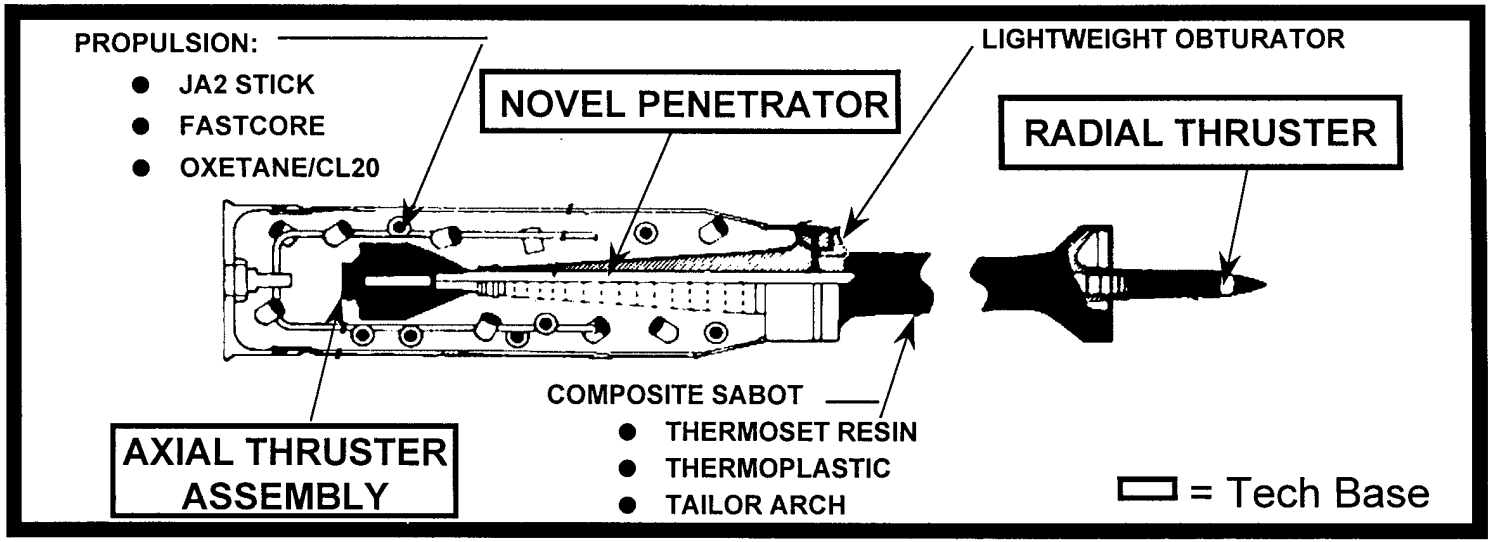
Hypervelocity Launch

- Novel Penetrators (Monolithic, Segmented, etc)

Bottom Line:

- **Armor Configurations Becoming More Complex**
- **Multiple Defeat Approaches Being Investigated**

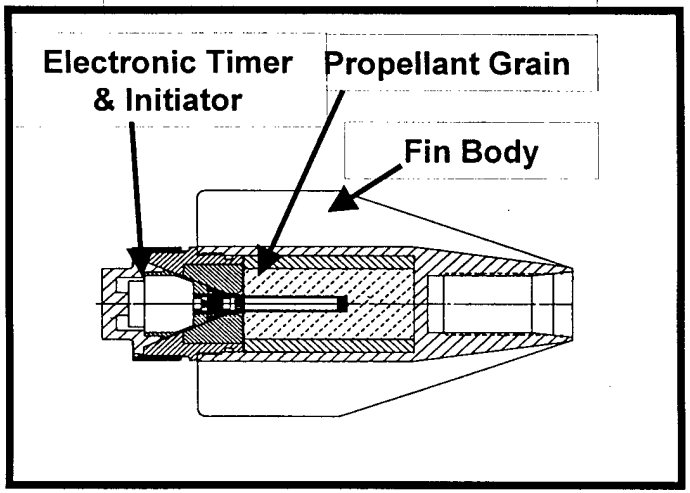
Advanced KE Cartridge Program
(Direct Fire Lethality ATD)



- Defeat of Explosive Reactive Armor Protected Threats And Increased System Accuracy FY97-01
- 40-70% RHAe Penetration Increase Over M829A2 At Extended Ranges
- 30 - 70% Increase In Probability Of Hit Over M829A2 At 3 KM
- Transition To PM-TMAS In FY01
- KEY PLAYERS: ARL, ARDEC, DARPA, PM-TMAS, USAARMC, Industry

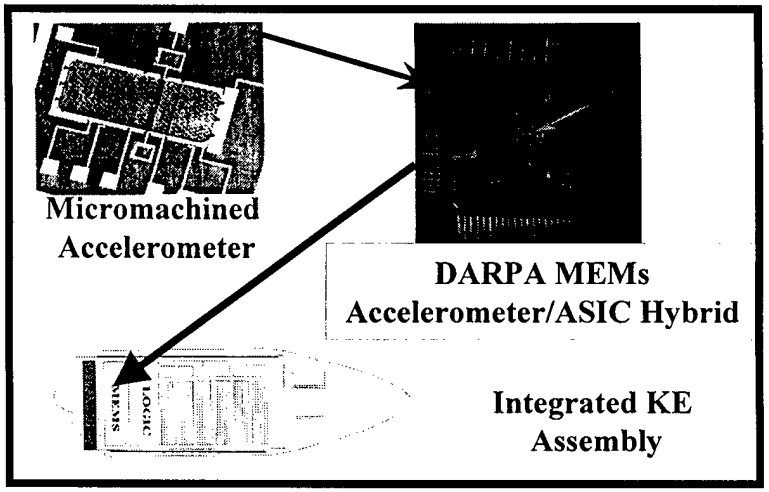
Enhanced Accuracy KE Technologies

Axial Thruster



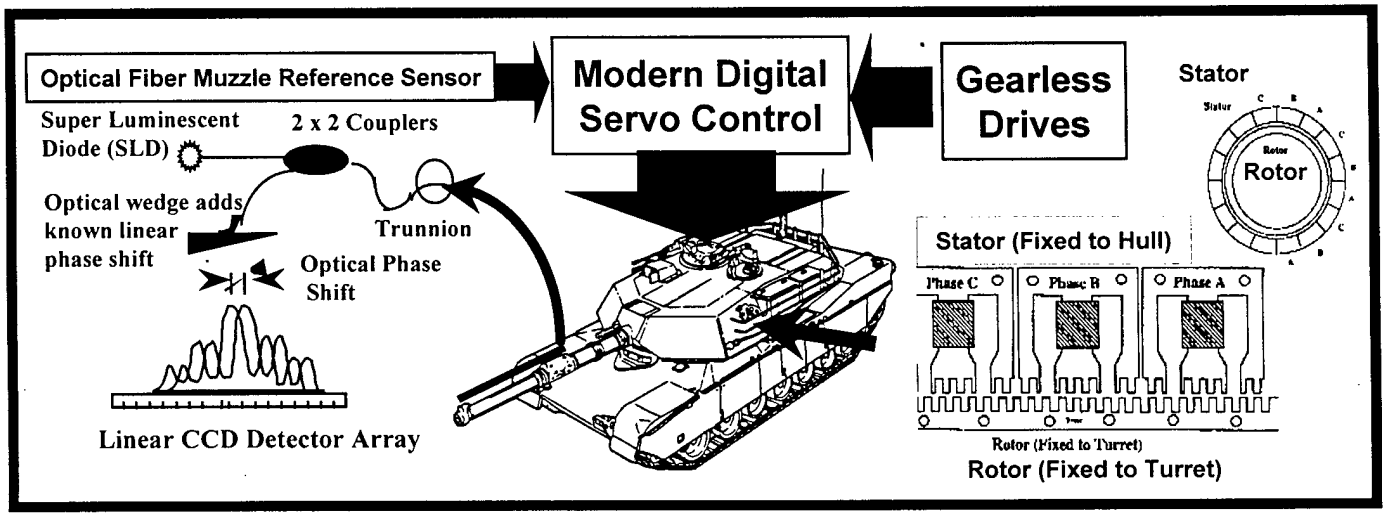
- Compensates for Aerodynamic Jump Error
- Up to 30% Increase in First Shot Hit Probability
- KE Course Correction Feasibility Demo Sept 98
- Transition to PM-TMAS

Radial Thruster



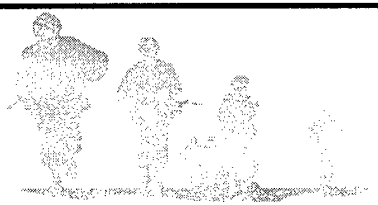
- Compensate for Total Jump Errors
- Leverages DARPA MEMs Accelerometer Technology Development
- Up to 70% Increase in First Shot Hit Probability
- Feasibility Demo With M830A1 FY98/99
- Miniature Thruster Demos FY99/00
- Integrated KE Penetrator Demo & Transition to PM-TMAS in FY01

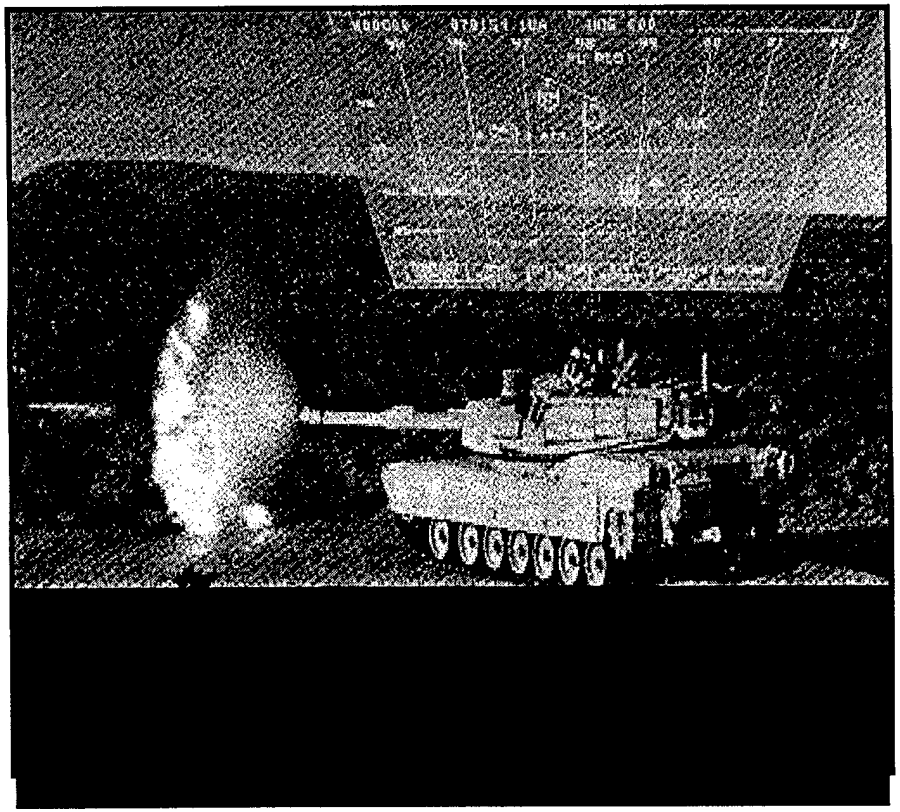
Advanced Drives and Weapon Stabilization
(Direct Fire Lethality ATD)



- Integrate Promising Technologies To Reduce System Errors Under Moving Conditions and Reduce O&S Costs (FY96-01)
- Demonstrate Increased Probability Of Hit Of 200% Over M1A2 At 3 KM Under Moving Conditions
- Validate, Through Analysis, Life Cycle Cost Savings With Elimination of Hydraulic/ Radioactive Components and Increased Reliability/Maintainability
- Transition To PM-Abrams In FY01
- KEY PLAYERS: ARDEC, PM-TMAS, PM-Abrams, USAARMC, Industry

Tank Extended Range Munition (TERM)





OPERATIONAL BENEFITS OF TERM

TERM provides the TF CDR:

- The capability to ***Expand*** his battlespace
  - A 4 fold increase (NON-Linear Battlefield)
- The capability to ***Shape*** his battlespace
  - Engaging RISTA & C2 elements setting the stage for successful ***Decisive Operations*** (Close Fight)
- Expands the capability of the M1A2 SEP Tank
  - Will become a ***mainstay*** of Legacy Forces

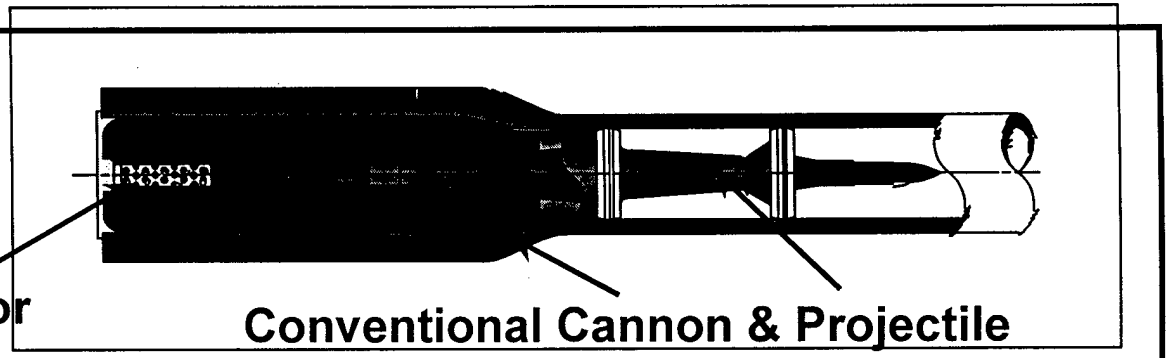
Tank Extended Range Munition (TERM) Advanced Technology Demonstration

Acquisition Strategy

- **Rigorous Front End Analysis (Joint ARL/RDEC/PM/User)**
  - Validate TERM Utility And Establish Technical Performance Potential
- **Early Pre-Solicitation Communications With Industry**
  - Aug 97 Industry Day (Distribution of RFP, ORD Requirements For Comment)
- **Senior Advisory Board "Sanity Check" (Oct 97)**
- **Contract Phases:**
  - 9-Month Phase I
    - » Up to three contract awards (Planned Jun 98)
    - » Detail candidate concept designs
  - 39-Month Phase II
    - » One or two candidates
    - » Conduct key performance demonstrations
    - » Demonstrate ATD Exit Criteria
- **Transition to PDRR or EMD in late FY02**

Possible *Fast Track* Acquisition Candidate

Electrothermal-Chemical Propulsion (ETC)

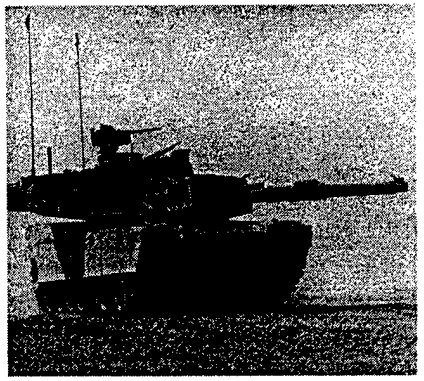


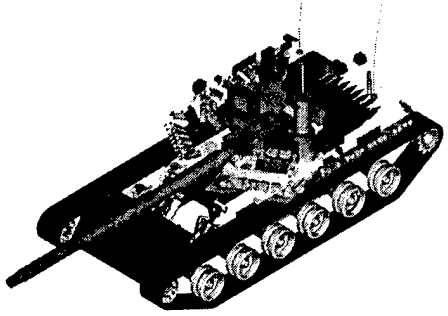
- INCREASE LETHALITY:
  - Higher Muzzle Energy
  - Exploit novel KE concepts
  - Potential for Hypervelocity: Up to ~2.2 km/s
- MINIMAL ELECTRIC POWER
- CONTROL OF IGNITION/COMBUSTION:
  - Precision ignition => improved accuracy
  - Eliminate temperature sensitivity => improved lethality
  - Advanced hi-energy, lo-vulnerability charges => improved lethality and survivability

ETC Development Roadmap

Near Term Program (1999-2001)
- *Low electrical energy*
- *Existing guns (M256/XM291)*
- *Advanced conventional propellants*
- *Grow muzzle velocity/launch mass*

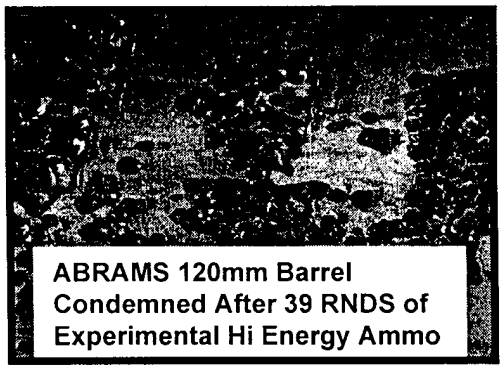
Continued Development 2000-2002+
- *120mm gun technology growth*
- *Advanced projectiles*
- *Novel propellants*
  - *lower vulnerability*
  - *high specific energy*
- *Embedded Temperature Sensors*
- *Supporting FCV/AAN Armament STOs*



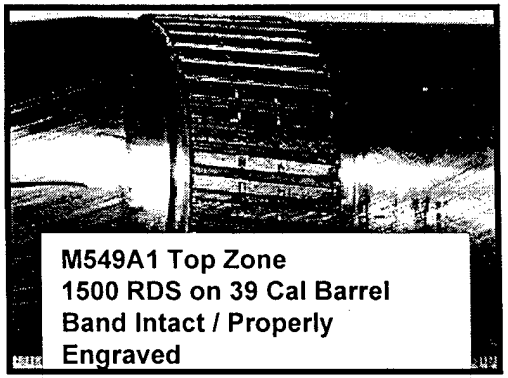


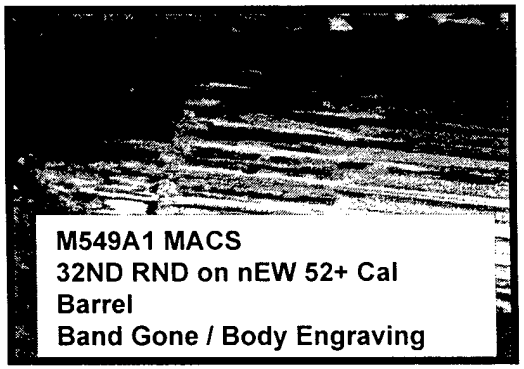
Far Term (2015+)
- *Advanced power & propellants*
- *Hypervelocity potential*
- *Low Vulnerability*
- *Tailored Launch Performance for Future "Family of Munitions"*

LARGE CALIBER ARMAMENT WEAR and EROSION



DIRECT FIRE: Barrel / Propellant Compatibility Issue



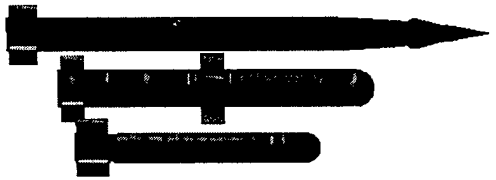
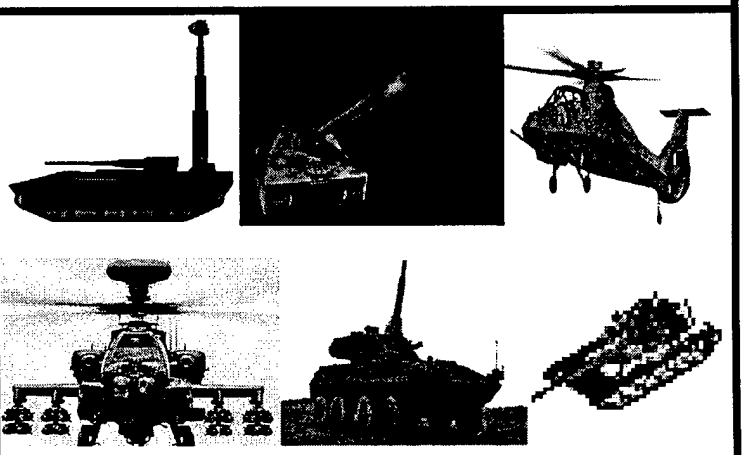
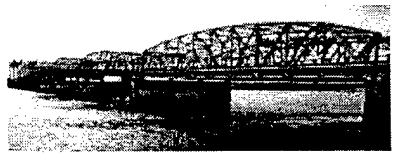


INDIRECT FIRE: Barrel / Projectile Compatibility Issue

- Demonstrate Promising Technologies to Reduce Evolving Wear and Erosion Issues (FY96-06)
- Current Tech Base Approaches:
  - DIRECT FIRE: - Wear and Temperature Resistant Barrel Coatings
    - High Energy Low Temperature Propellant Formulations
  - INDIRECT FIRE: - Improved Band and Obturation System
- Deliverables:
  - DIRECT FIRE: - Med Cal Barrel Coatings Demonstrator by FY01
    - Scale Coating Technology to Large Cal by FY04 (MTO Proposal)
    - Improved Propellant Formulations by FY02
  - INDIRECT FIRE: - Band Obturation System for ERO by FY01
    - Obturation Retrofit Design for Inventory by FY01
- Coatings Technology Transitionable to Industry by FY01 (Med Cal Barrel Producers)

Horizontal Technology Integration Opportunities

- KE Novel Penetrators
- Radial Thruster
- Gearless Drives
- Optical Fiber Muzzle MRS
- ETC Propulsion
- Barrel Coatings
- ???

Missiles	
All Turreted Weapon Systems	
Commercial Applications	 ???

Summary

- Investment in Lethality Sustainment a Major Priority
- Tech Base Providing Key Performance Gains
- New initiatives (i.e. TERM) can provide Abrams (w/FSCS) Army After Next Capabilities
- Industry/OGA Responding to Lethality Challenges
- Opportunities Exist to Team With Industry and Other Services for Technology Transfer